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June 20, 2007

Mr. William L. Bider, CEP
Director
Kansas Department of Health & Environment
Bureau of Waste Management
1000 SW Jackson St., Ste. 320
Topeka, KS 66612-1366

Re: Proposed Closure Plan
Former Evaporation Lagoon
Abbott Property, Wichita, Kansas

Dear Mr. Bider:

Thank you for taking the time to meet with us in December 2006. We appreciated the opportunity to present our proposed closure plan for the former evaporation lagoon at Abbott's property in Wichita. We also appreciated the good discussion and feedback provided by the meeting participants. There appeared to be general agreement about our proposed approach for the closure plan. You and your staff requested that we include some additional information and clarification within Abbott's formal request for closure plan approval. We have incorporated your suggestions and submit this document as Abbott's proposed closure plan for KDHE's review and approval. The Plan consists of 5 key steps as follows:

- Step 1 – Cap Enhancement to Prevent Contaminated Leachate to Groundwater
- Step 2 – Collection and Monitoring of Leachate / Perched Water to Confirm Effectiveness of Enhanced Cap
- Step 3 - Formal Operations & Maintenance Plan for Former Lagoon Cap
- Step 4 – Confirmation of Limited Groundwater Contaminant Presence
- Step 5 – Implementation of Monitored Natural Attenuation to Closure

As we discussed during the December meeting and summarized below, Abbott has already completed Steps 1 through 4 in accordance with various correspondences and approvals by the Kansas Department of Health and Environment (KDHE).

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Step 1 – Cap Enhancement to Prevent Contaminated Leachate to Groundwater

Monitoring data indicated that the previously constructed former evaporation lagoon cap did not sufficiently prevent the generation of leachate; therefore, an enhanced cap was engineered and constructed with impermeable materials and proper grading to prevent ponding, infiltration of precipitation, and generation of leachate. Plans and Cross-Sections of the enhanced cap design are provided in Attachment 1.

The enhanced cap was completed in October 2005, under a KDHE-approved Construction Quality Assurance (CQA) Plan, and now meets current KDHE surface impoundment standards. A post CQA Report was submitted to, and approved by, the KDHE in March 2006. Copies of KDHE approvals are provided in Attachment 2, and pictures taken during the various phases of cap enhancement are provided in Attachment 3.

Step 2 – Collection and Monitoring of Leachate / Perched Water to Confirm Effectiveness of Enhanced Cap

As we discussed during our meeting, the leachate collection system that was in place before the cap enhancement remains in place and in operation; however, given the drastic reduction in volume collected, Abbott (after notification to the KDHE UIC Program) has discontinued disposing the water collected by the system into the UIC well. This water is now pumped to an on-site aboveground holding tank and disposed of offsite on an as-needed basis. A representative cross-section of the leachate collection system design is provided in Figure 1.

We have been evaluating the effectiveness of the enhanced cap by monitoring the volume of leachate / perched water (water) collected in the sump that is part of the existing leachate collection system on a monthly basis. As part of this monitoring, the data have been compared with the volume of precipitation in the area (as measured at the nearby Wichita airport and reported by the National Oceanic and Atmospheric Agency {NOAA} National Weather Service) to determine whether a correlation exists between the volume of water collected in the sump and precipitation. This comparison shows the volume of water collected in the sump remains relatively constant, irrespective of precipitation. Therefore, we have concluded that precipitation has not influenced the volume of water collected in the sump. Given this, and the significant reduction confirmed by the monitoring, it is concluded that the enhanced cap is an effective control for eliminating leachate generation from the former evaporation lagoon.

The volumes of water collected in the sump and area precipitation are provided in Attachment 4. As explained in more detail below, we believe the results of the monitoring confirm the virtual elimination of leachate generation through the former evaporation lagoon. Before the cap was enhanced, an average of 2,600 gallons per week of leachate was generated. Currently, an average of less than 25 gallons per week of water is collected in the sump, amounting to a 99% reduction. We have concluded that the small volume of residual water that continues to collect in the sump is non-leachate that, as a result of soil moisture condensation and a degree of perched water from around the outside edges, seeps into the collection system via lateral drainage. This

conclusion is supported by the Remedial Facility Investigation confirming perched water in and around the area of the former lagoon at a depth in the zone of the leachate collection system.

To further evaluate the effectiveness of the enhanced cap, Abbott has evaluated quarterly monitoring data of water that has collected in the leachate collection system sump reflective of conditions prior to and after cap enhancement. This evaluation shows minor fluctuations in leachate contaminant concentrations before and shortly after cap enhancement, but in general, concentrations of contaminants appear to have decreased since the cap was enhanced. A summary table and graph of sump water contaminants are provided in Attachment 5, and show since July 2005 (the approximate time that the cap, while not fully completed, was essentially completed enough to prevent precipitation infiltration) concentrations of dicyclohexylamine, n,n-dimethylcyclohexylamine, n-methyldicyclohexylamine, and o-toluidine have decreased overall.

Abbott recognizes the post-cap enhancement sump water monitoring data set is limited and that additional quarterly monitoring data is necessary for a more comprehensive evaluation of concentration trends. Abbott therefore proposes, as we move forward with this closure plan, to continue quarterly monitoring of water accumulating in the sump, whereby both the volume and quality of the accumulated water will be monitored and recorded to allow for trending. A representative sample of the water that has accumulated in the sump during that quarter will be collected and analyzed for the contaminants that were detected in the leachate prior to cap enhancement. We expect this analysis will confirm a continuing downtrend in contaminant concentrations as the leachate retained in the former lagoon has been largely drained since the enhancement/installation of the new cap. However, we still expect to see some degree of contaminant detection in the water samples, derived from condensation of moisture entrained in the contaminated soil and sludge that remained capped in the former lagoon. This monitoring will continue until Abbott determines (and KDHE approves) that sufficient representative data has been obtained to confirm concentration trends.

Step 3 – Formal Operations & Maintenance of Former Lagoon Cap

As part of the enhanced cap design, Abbott established a site-specific Operations & Maintenance Plan (O&M Plan) to ensure the integrity of the enhanced cap is maintained. The plan ensures the following:

- Proper grade is maintained
- Integrity of berms
- No erosion problems
- Monitoring well network is maintained in good working condition
- Security is maintained to restrict access

This plan was approved by the KDHE as part of the approved Cap Construction Plan, and has been implemented since the enhanced cap was completed.

Cap integrity inspections have generally been conducted quarterly since construction with no problems identified. The plan specifies that if any conditions affecting cap integrity are identified during the inspections, repairs/modifications will be implemented as needed. Future inspections will continue on a quarterly basis for one year after formal approval of this plan. If, no issues have been identified after four consecutive quarterly inspections, the inspection frequency will be adjusted from quarterly to annually. Moving forward, each inspection will be documented in an Inspection Log. An example Inspection Log template is provided in Attachment 6.

Step 4 - Confirmation of Limited Groundwater Contaminants

Abbott completed a comprehensive review of over 23 years of groundwater monitoring data to confirm the limited contaminants remaining in the groundwater, and based on this review, we propose that only the following three contaminants warrant monitoring going forward:

- n-Methylcyclohexylamine
- Dicyclohexylamine
- o-Toluidine

The comprehensive data evaluation and rationale for our conclusion/proposal are summarized as follows:

All of the historical data and reports in Abbott's possession (dating back to 1983) were assembled and reviewed. The Resource Conservation and Recovery Act (RCRA) Remedial Facility Investigation (RFI) report that was completed in 1992, which contained long-term data, indicates 100 contaminants had routinely been screened at the site. According to the RFI, these chemicals included all of the potential chemicals used and generated at the facility in addition to those that may have originated from neighboring industrial facilities. A list of these 100 contaminants is provided in Table 1. The RFI further indicates that 59 of the 100 contaminants were excluded as contaminants of concern as they were always non-detect. These 59 contaminants have red strikeouts through them in Table 2. An additional 17 contaminants were also excluded by the US EPA through the RFI due to their respective low frequencies of detection (10% of the time or less). These contaminants have green strikeouts through them in Table 2. Two contaminants were excluded as they were concluded to be laboratory contaminants. These compounds have violet strikeouts through them in Table 2. The remaining 22 compounds in Table 2 were considered representative contaminants at the site. Of these 22 compounds, it was determined that 10 were not attributable to Abbott and were removed from the list of Abbott contaminants of concern as it was concluded they were never used by Abbott and thought to have migrated onto the site from neighboring facilities. These 10 compounds have dark blue strikeouts through them in Table 2. Therefore, the remaining 12 compounds with no strikeouts and bolded in Table 2 were considered attributable to Abbott.

Abbott conducted a comprehensive review of the historical data associated with both the wells considered to be representative of the groundwater in the RFI, and the wells of interest within the

CMI for these 12 compounds, to confirm the frequency of sampling, analysis, and levels of detection, and to determine whether future monitoring is warranted. A summary table for each compound was created to show sample period, sample results, and Method Detection Levels (MDLs), where applicable. Each of these summary tables is provided in Attachment 7. As indicated in the attached tables, each of the compounds had been routinely analyzed in numerous wells since 1983.

Based upon the extensive data review, we have concluded nine of the 12 compounds are no longer present as contaminants of concern (COC) and propose to eliminate them as COCs. This conclusion is based upon the fact that the sampling results indicate the compounds have degraded to non-detect or to below applicable standards of comparison (i.e. either respective Preliminary Remediation Goal {PRG}, Maximum Contaminant Level {MCL}, or site-specific risk based clean up objective further discussed below) for an extended period of time. Our rationale for this conclusion and proposing the nine compounds be eliminated as COCs going forward is as follows:

- 3(n,n-Dimethylamino)propylnitrile – Decreased concentrations to non-detect since 1990; most recently sampled in 2003. Note that this compound has been sampled in 41 different quarters since it was last detected.

- Aniline - Decreased concentrations to non-detect since 1993; most recently sampled in 2004. Note that this compound has been sampled in 35 different quarters since it was last detected.

- Cyclohexylamine - Decreased concentrations to non-detect since 2000. Note that this compound has been sampled in 14 different quarters since it was last detected.

- n,n-Dimethylcyclohexylamine - Decreased concentrations to non-detect since 1999; most recently sampled in Q1 05. Note that this compound has been sampled in 16 different quarters since it was last detected.

- Pentamethyldipropylenetriamine – Limited concentrations to non-detect since 1995; most recently sampled in Q1 03. Note that this compound has been sampled in 23 different quarters since it was last detected.

- Piperidine - Decreased concentrations to non-detect since 1990; most recently sampled in 2003. Note that this compound has been sampled in 41 different quarters since it was last detected.

In addition, we propose that benzene and toluene also be eliminated as COCs, as they have been detected only on a sporadic basis and in low concentrations typically below their respective MCLs. In fact, benzene has not been detected above its MCL in 12 quarterly rounds of monitoring since Q3 1992, and toluene has never been detected above its MCL in seven rounds of monitoring between 1990 and 1991, and has not been detected in the last seven rounds of monitoring (most recently monitored in Q3 04).

We also propose that n-methyldicyclohexylamine no longer be considered a COC because it has not been detected above its surrogate standard (the same standard that the US EPA approved using the similarly structured n-methylcyclohexylamine) since 1991 and has been sampled 37 times since then.

So based upon this review, we propose that the following three compounds be managed as COCs going forward, as they have historically been detected during both historical and recent monitoring in 2005-2006:

- n-Methylcyclohexylamine
- Dicyclohexylamine
- o-Toluidine

Step 5 – Implementation of Monitored Natural Attenuation to Closure

After considering several options, Abbott has concluded that monitored-natural attenuation (MNA) be the approach for formal closure of the former evaporation lagoon. This conclusion is based upon several technical factors, primarily:

- The long-term groundwater monitoring confirms the majority of groundwater contaminants attributable to Abbott have attenuated and degraded over time.

- The concentrations of the limited remaining contaminants in the groundwater are generally decreasing with time.

- Groundwater contaminant modeling indicates contaminant degradation will continue with time to below risk-based standards before reaching the property line.

This MNA will involve continued groundwater monitoring in accordance with a formal, written, KDHE-approved monitoring plan to verify there is no off-site migration of any of the COCs in concentrations above established standards. During this monitoring, wells MW-4, 8, 16, and 102 clusters will be sampled and analyzed on a semi-annual basis for one year. Abbott proposes to sample these well clusters based upon their representative positioning down gradient location from the former lagoon, in addition to their varied vertical positioning. The locations of these wells are shown in Figure 2. If concentration trends have not increased, over the course of the semi-annual sampling, we propose that the sampling will then be conducted on an annual basis thereafter. If concentration trends are seen to increase significantly, then other closure alternatives will be evaluated and discussed with KDHE.

Each of the samples will be analyzed for the three COCs identified in Step 4. The analytical results will then be compared to site-specific, risk-based cleanup objectives that have been prepared in accordance with methods approved by both the US EPA and KDHE. These methods include:

- US EPA's *Alternative Concentration Limit Guidance, Interim Final* – 9481.00-6C, 1987
- ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM E 1739-95.
- KDHE's *Risk-Based Standards for Kansas (RSK) Manual* – 3rd Version, march 1, 2003.
- KDHE's *Considerations for Remedial Standards* – BER-RS-033, revised December 2005.
- KDHE's *Considerations for Groundwater Use and Applying RSK Standards to Contaminated Groundwater* – BER-RS-045, February 23, 2004.

Following these methods, establishing the Point of Exposure (POE) at the property line, and incorporating site-specific inputs, Abbott calculated site-specific risk-based cleanup objectives for each of the three COCs. These objectives are presented in Table 3, and backup data for their calculations are provided in Attachment 8. Due to the absence of respective published chronic toxicity values, Abbott requested approval to use published toxicity values for cyclohexylamine as surrogate/proxy values when calculating the objectives for dicyclohexylamine and n-methylcyclohexylamine. A Quantitative Structure-Activity Relationship (QSAR) analysis confirmed correlations in chemical indices and activity in biological systems, so the US EPA Superfund Technical Support Center (STSC) recommended using cyclohexylamine as a surrogate and the US EPA subsequently approved our request. A copy of the US EPA approval letter is provided in Attachment 9.

A brief report summarizing the groundwater monitoring and results will be provided to KDHE after each monitoring event. This monitoring and reporting will continue until analysis confirms the following:

- Concentrations of the three COCs are below the site-specific cleanup objectives for two consecutive sampling events; and,
- Conditions of the enhanced cap remain such that there is no ponding on top of the cap, no significant increase in liquid collected through the leachate collection system, and there is no other such evidence of questionable integrity of the enhanced cap.

At that time, Abbott will then submit a final closure report summarizing the results of each step of the closure and a formal request for concurrence of closure from the KDHE.

Conclusion

Given the nature of, and low risk posed by, the site, this plan is an effective and appropriate approach to closure for several reasons including:

- The former evaporation lagoon cap has been successfully reconstructed and enhanced so it eliminates leachate with a potential to contaminate groundwater beneath the site.

- Plans are put in place to maintain the integrity of the enhanced cap so it continues to provide a more effective source control than before.

- The comprehensive evaluation of long-term monitoring results confirms the majority of contaminants have naturally degraded away leaving only a limited number of remaining COCs, whose concentrations are naturally decreasing as well.

- The limited contaminant plume poses no real risk as there are no viable receptors at the site and/or within a one-mile radius.

- Results of transport modeling using ASTM Risk-Based Corrective Action (RBCA), Air Force Center for Environmental Excellence BIOSCREEN, and Kansas Risk-Based Corrective Action (KRBCA) methods conclude the remaining COCs will degrade to below their respective site-specific clean up objectives well before the property line. Modeling documentation is provided in Attachment 10.

- The approach is consistent with US EPA and KDHE Guidance

Based upon these conclusions, Abbott requests KDHE approval of this Closure Plan. Upon receipt of the written approval, we will then coordinate with you and put the remaining actions in place to complete the closure as outlined in this plan. If you have any questions, concerns, or need additional information, please don't hesitate to contact me.

Best regards,

Abbott Laboratories

Lindell A. Sneed
Manager, Environmental Programs
Global Environment, Health & Safety

cc: C. Michols, Abbott
A. Boon, Abbott
D. Garrett, US EPA
C. Serna, Matrix

Tables

Table 1 – 100 Groundwater Contaminants Screened at Site
Table 2 – Status of Groundwater Contaminants
Table 3 – Site-Specific Cleanup Objectives

Figures

Figure 1 – Cross-Section of Leachate Collection System
Figure 2 – Location of MNA Groundwater Monitoring Wells

Attachments

Attachment 1 – Plans and Cross-Sections of Enhanced Cap
Attachment 2 – KDHE Approvals
Attachment 3 – Selected Pictures Taken During Enhanced Cap Construction
Attachment 4 – Estimated Water from Sump vs. Precipitation
Attachment 5 – Sump Monitoring Summary
Attachment 6 – Cap Inspection Log
Attachment 7 – Contaminant Sampling and Detection Summary Tables
Attachment 8 – Site-Specific Cleanup Objective Calculations
Attachment 9 – Surrogate Toxicity Value Approval Letter
Attachment 10 – Contaminant Modeling Documentation